APPENDIX

520.35237CV4

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	T. KAJI, et al.
Application No.:	10/808,559
Filed:	March 25, 2004
For:	A PLASMA PROCESSING APPARATUS
Art Unit:	1763
Examiner:	M. Crowell

DECLARATION UNDER 37 CFR §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, **Shinichi Tachi,** do hereby verily declare that:

1. I received the Ph. D. degree in electronic engineering from Osaka University in 1979.

2. From 1979 until 1994 and from 1995 until 2002, I have worked as a member of the Central Research Laboratory, Hitachi, Ltd.

Additionally, I spent and worked for two years from 1994-1995 at headquarters of Hitachi, Ltd., as a planning and marketing officer. As a whole, I worked for 25 years in Hitachi, Ltd.

In addition, I moved to Hitachi High-technologies Co. in 2002 as a deputy general manager of Naka works. I established research and development division there in 2003. I am now an executive officer and general manager of Kasado works

of Hitachi High-technologies Co. The main product, which I have engaged in, is the plasma etching machine.

3. As a member of Scientific/Engineering Societies in the Central Research Laboratory, I had been engaged in developing plasma processing, ion beam technology, ion-solid interaction and semiconductor surface treatments.

Through many activities, I have participated in development of LSI chip processing by collaborating with many semiconductor device industries.

I have been a member of Japan Society of Applied Physics, Institute of Electrical Engineering of Japan, and American Vacuum Society,. and have worked as a committee member of International Dry Process Symposium for these 25 years, and was a chairman in 2003 and 2004.

4. In addition, I have written the following articles in my field:

(1) S. Tachi, M. Izawa, K . Tsujimoto, T. Kure, N. Kofuji, K. .Suzuki, R. Hamasaki, and M. Kojima, J. Vac. Soc. Technol. A16, 250 (1998).

(2) S. Tachi, M. Izawa, and M. Kojima, 1997 Dry Process Symp.

(3) M. Izawa, S. Tachi, R. Hamasaki, T. Yoshida, and M. Kojima, 1997 Dry Process Symp.

(4) M. Izawa, K. Yokogawa, S. Yamamoto, N. Negishi, Y. Momonoi, K. Tsujimoto, and S. Tachi, 1999 Dry Process Symp.

(5) Y. Gotoh, T. Kure, and S. Tachi, Jpn. J. Appl. Phys. 32, 3035 (1993).

(6) M. Mori, N. Itabashi, H. Ishimura, H. Akiyama, T. Fujii, G. Saito, M. Yoshigai, M. Kojima, K. Okamoto, K. Tsujimoto, and S. Tachi, Proc. SSDM 2000.

(7) N. Kofuji, T. Tsutsumi, E. Matsunmoto, K. Fujimoto, N. Itabashi, M. Izawa, T. Fujii, and S. Tachi, Proc. SSDM 2001 Symp.

(8) N. Kofuji, T. Tsutsumi, E. Matsumoto, K. Fujimoto, N. Itabashi, M. Izawa, T. Fujii, and S. Tachi, 2001 Dry Process Symp.

(9) K. Yokogawa, N. Negishi, S. Yamamoto, K. Suzuki, and S. Tachi, 1997 Dry Process Symp.

(10) N. Negishi, M. Izawa, K. Yokogawa, Y. Momonoi, T. Yoshida, K. Nakaune, H. Kawasaki, K. Kojima, K. Tsujimoto, and S. Tachi, 2000 Dry Process Symp.

(11) Masaru Izawa, Shinichi Tachi, and Nobuyuki Negishi, Reaction mechanism in plasma processing., The Vacuum Society of Japan, 2001.

5. I am one of the listed inventors in U.S. Patent Application Serial No. 10/808,559 (hereinafter referred to as "the above identified patent application".) I have carefully read the above-identified application including reviewing the drawings and the claims of the patent application. I have also carefully read the Office Action dated November 17, 2005, as well as USP 5,534,751 to Lenz and USP 5,272,417 to Ohmi.

6. With regard to the above-identified patent application, the specification states on page 40, line 8, et seq., that the discharge confining means, such as indicated by the numeral 37 in Fig. 1, is made of silicon, carbon or SiC. As noted on page 40, line 10 et seq., by virtue of the use of these materials:

> "When the discharge confining ring 37 is connected to a high frequency electric power source to cause sputtering by ions, it is possible to decrease attaching of deposits to the ring 37 and also to remove fluorine."

In each case of using either silicon, carbon or SiC, it is important to note that the material used is free of oxygen (unlike materials such as quartz and silica which both contain oxygen). This avoidance of oxygen is very important in the construction of the discharge confining means, for reasons which will be discussed below. In addition, from further studies of the etching process by me and my co-inventors, we have now determined that making the discharge confining means of silicon has a substantial advantage, not only over materials such as quartz and silica, but also over other materials such as carbon and SiC.

Essentially, our studies have shown that the discharge confining means essentially constitutes a floating electrode during operation of the plasma apparatus. In particular, the discharge confining means has an electric potential on it during the plasma etching operation. As a result, the discharge confining means itself is etched by the plasma. If the discharge confining means contains oxygen, this etching of the discharge confining means will spread the oxygen into the plasma itself, thereby deteriorating plasma and the etching process itself.

In addition to excluding oxygen, we (that is, the inventors) have determined that forming the discharge confining means of the same material as the etched wafer

(specifically silicon) has the advantage that the etching of the discharge confining means itself will have no adverse effects at all on either the plasma or the etched wafer since material other than silicon will not be released into the plasma. Therefore, we have found that silicon is superior not only to materials such as quartz and silica which contain oxygen, but also to materials such as carbon and SiC mentioned as alternatives in the specification, since the etching of these materials will also release materials into the plasma different from the base material of the sample being etched.

With regard to the Lenz Patent, it is noted that column 6, lines 18 through 29 specifically states that the ring assembly 30 which serves as a confinement shield is made of high quality fused silica or quartz. Since both of these materials include oxygen, the Lenz discharge confining means will suffer the above noted problem that, during the etching process, the discharge confining means itself will be etched, thereby releasing oxygen into the plasma. Therefore, the etching of the wafer will be degraded, compared to the superior results which can be achieved using the invention disclosed in the above-identified patent application, specifically, by making the discharge confining means of silicon. In addition, it was noted that the secondary reference to Ohmi noted in the Office Action fails to add anything which would suggest modifying Lenz to make the discharge confining means of silicon, without oxygen.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false

statements and the like so made are punishable by fine, or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Further Declarant sayeth not.

2/10/06 Shinichi Tachi

Date Shinichi Tachi